INSTRUCTION BOOK FOR

BIRD

SERIES 8920
TERMALINE® LOAD RESISTORS

✓ PDF
Bird 8920 Termaline
Load Resistors

MP MASTER
MA34306

LIMITED WARRANTY

We are proud of the high quality of our product and we warrant to the original purchaser that each new instrument of our manufacture will for a period of one year after original shipment be free from defects in material and workmanship under normal and proper operating conditions and that properly used during such period it will perform in accordance with our applicable specifications.

Our obligation and the purchaser's exclusive remedy for any defect or failure to meet specifications shall be limited, at our option, to repair or replacement, or if we determine said defect or failure to be so defective as to preclude remedying by repair or replacement, the purchaser's sole and exclusive remedy shall be limited to refund of the purchase price. We shall have no obligation if defects result from improper use, operation above rated capacities, repairs not made by us, or misapplication of the equipment. Our warranty does not extend to the failure of semiconductor devices and batteries, or to equipment and parts made by others except to the extent of the original manufacturer's warranty to us. No other warranty is expressed or implied. Bird Electronic Corporation is not liable for consequential damages.

Warranty returns must be first authorized by the factory office and are to be shipped prepaid.

MODELS COVERED IN THIS INSTRUCTION BOOK

8921 8922
8926 8927
8928

INSTRUCTION BOOK

FOR

SERIES 8920

TERMALINE® LOAD RESISTORS

Electronic Corporation

30303 Aurora Road, Cleveland, Ohio 44139-2794

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SAFETY PRECAUTIONS

The following are general safety precautions that are not necessarily related to any specific part of procedures and do not necessarily appear elsewhere in this publication.

Keep away from live circuits.

Operating personnel must at all times observe normal safety regulations. Do not attempt to replace parts or disconnect a RF transmission or any other high voltage line while power is applied. When working with high voltage always have someone present who is capable of rendering aid if necessary. Personnel working with or near high voltage should be familiar with modern methods of resuscitation.

The following will appear in the text of this publication and is shown here for emphasis.

****
* C A U T I O N *
*
* This equipment is designed for operation in a horizon- *
* tal position only, with mounting brackets down. Do not *
* operate in any other manner. *
****

****
* W A R N I N G *
*
* Before placing the unit into operation, remove the *
* shipping plugs at the top of the radiator, near the *
* front, and replace with the specially shielded breather *
* plugs. These breather plugs open at a preset pressure *
* and should be installed in place when the unit is in *
* operation. Failure to do this could result in damage *
* to the equipment and endanger the operator's safety. *
****

****
* W A R N I N G *
*
* Using this load in the upper end of its power dissipa- *
* tion range will cause the housing to become hot! Care *
* should be exercised in touching it. *
****

Continued

CAUTION

Do not excessively overload these units above the rated 5 kilowatts of power. Overload for any length of time will cause resistor failure.

WARNING

Provide adequate ventilation and observe normal precautions when using dry cleaning solvents. Many dry cleaning agents emit toxic fumes that may be harmful to your health if inhaled.

CAUTION

Use no other coolant than that provide by Bird Electronic Corporation. The use of any other dielectric coolant will alter seriously the stated specifications.

TABLE OF CONTENTS

	Page
SAFETY PRECAUTIONS	i
INTRODUCTION	
Purpose and Function	iv
Power and Utility Requirements	iv
General Description	iv
SECTION I - INSTALLATION	
General	1
Location	1
Venting	1
Thermoswitch	2
SECTION II - THEORY OF OPERATION	
Description	4
Coolant	4
Heat Transfer	4
SECTION III - OPERATING INSTRUCTIONS	
Load Resistor Connection	5
Load Resistor Operation	5
SECTION IV - MAINTENANCE	
General	7
Cleaning	7
Load Resistor Check	7
Load Resistor Replacement	7
Coolant	8
RF Input Connector	8
SECTION V - REPLACEMENT PARTS LIST	
Series 8920	10
ILLUSTRATIONS	
Outline Drawing Model 8921	vi
Thermoswitch Assembly	3
Shipping Plug	11
Shielded Vent Plug Assembly	11
TABLES	
Specifications	v

SERIES 8920 TERMALINE® LOAD RESISTORS

INTRODUCTION

PURPOSE AND FUNCTION

The Series 8920 TERMALINE® Load Resistor is designed as a low reflection and nonradiating termination for coaxial RF transmission lines, to aid in the tuning and troubleshooting of transmission equipment within its rating.

POWER AND UTILITY REQUIREMENTS

The Series 8920 is fully self-contained. No outside power source is required. An over-temperature thermoswitch, P/N 8890-008, is provided for use in the operation of this load to prevent damage which could occur from accidental transmitter power overload, see Section I - Installation.

GENERAL DESCRIPTION

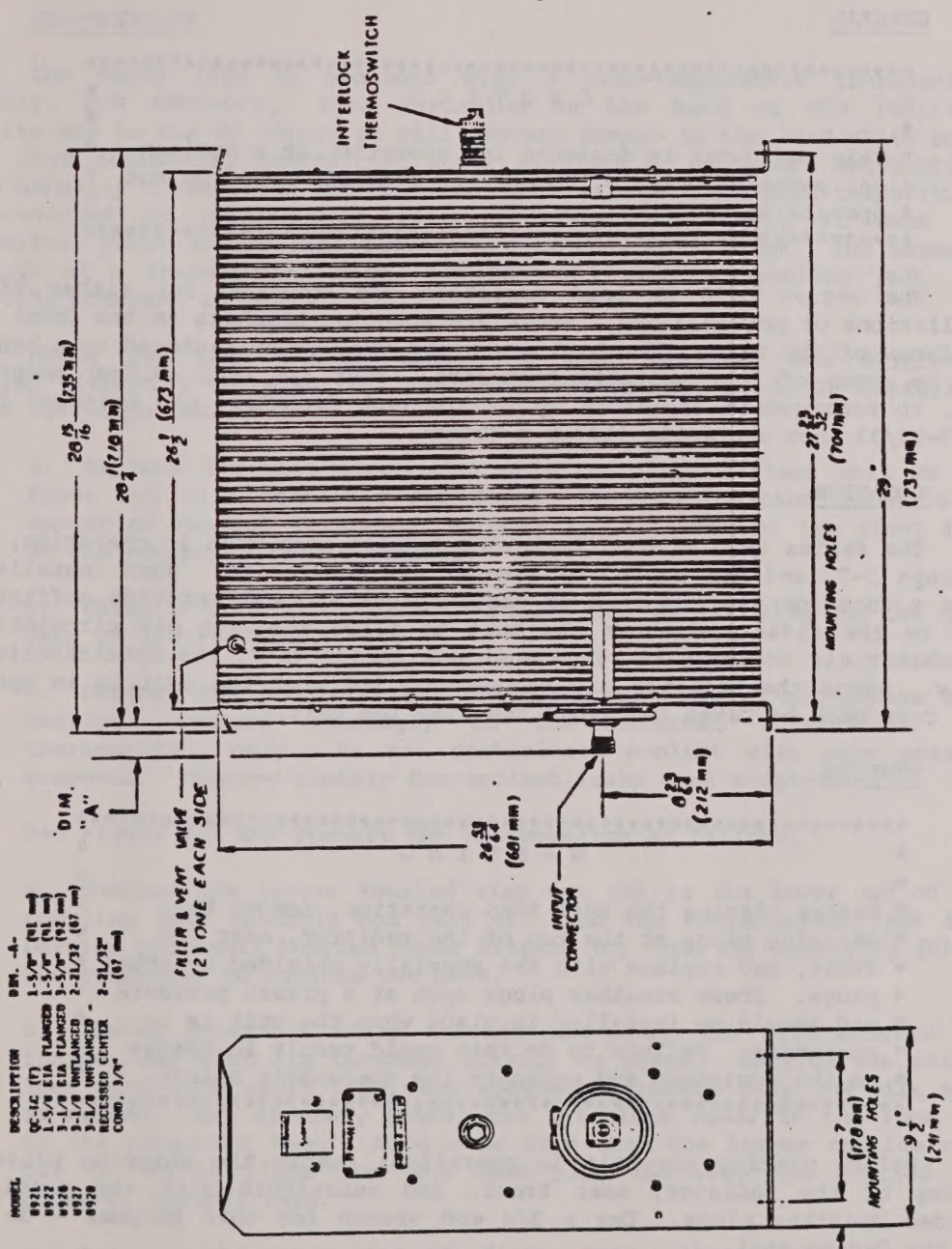
Attached to the front and rear panels are mounting flanges. These flanges act as supports for free standing use in portable applications, or as mounting brackets for optional fixed installation. There are mounting holes provided in the flanges for this purpose, see Section I - Installation. Convenient carrying flaps are also provided at each end of the radiator.

The RF input connection is on the lower front face of the unit. The respective models are designed for use with 3-1/8 inch or 1-5/8 inch rigid lines, or for cable types using large LC or LT type connectors. Connection arrangements are described in Section II - Theory of Operation, Bird "Quick-Change" connectors with their method of change, are described in Section IV - Maintence. The load unit is filled with a specially selected dielectric coolant. Near the top and to the front on either side of the dummy load are two vent plugs which relieve internal pressure resulting from expansion of heated coolant.

SPECIFICATIONS FOR SERIES 8920 TERMALINE® LOAD RESISTORS

Impedance	50 ohms nominal
VSWR	1.1:1 maximum dc - 1GHz
Connectors	
Model 8921	Female LC, Bird "QC" Type
Model 8922	1-5/8" EIA Flanged
Model 8926	3-1/8" EIA Flanged
Model 8927	3-1/8" Unflanged
Model 8928	3-1/8" Unflanged (recessed center conductor)
Power Rating	5000W
Frequency Range	dc - 1GHz
Dimensions	29"L* x 9-1/2"W x 26-53/64"H (737 x 241 x 681mm) *Input connector not included in length
Ambient Temperature	-40°C to +45°C (-40°F to +113°F)
Cooling Method	Dielectric liquid and natural air convection
Coolant Capacity	6-2/3 U.S. gallons (25.23 liters)
Weight	126 lbs. (57.15kg) approximate
Finish	Light navy grey baked enamel
Mode	CW, AM, FM, SSB, TV & Pulsed Systems

Figure I-1. Outline Drawing Model 8921.



SECTION I - INSTALLATION

1-1. GENERAL

```
**************************************************************
*                        C A U T I O N                       *
*                                                            *
* This equipment is designed for operation in a horizon-     *
* tal position only, with mounting brackets down. Do not     *
* operate in any other manner.                               *
**************************************************************
```

1-2. The Series 8920 RF Load Resistors are equipped for either fixed installations or portable use. There are mounting brackets on the front and rear faces of the unit. The load may stand free or be fastened to a bench, etc., by means of four suitable fasteners. Four 3/8 inch (9.5mm) mounting holes, to accommodate fasteners up to 3/8 inch diameter, are arranged in a 7 x 27-23/32 inch rectangle (177.8 x 704mm).

1-3. LOCATION

1-4. The Series 8920 RF Load Resistors develop heat when in operation, see Paragraph 2-7, and are cooled by natural air convection. When installing, select a location that is free of obstructions and will provide sufficient space to the sides and above the unit to allow adequate air circulation. The ambient air temperature range must not exceed 45°C, see Specifications, Page v. Since the radiator may become very hot when the unit is in operation, care must be taken and avoid touching the unit.

1-5. VENTING

```
**************************************************************
*                        W A R N I N G                       *
*                                                            *
* Before placing the unit into operation, remove the         *
* shipping plugs at the top of the radiator, near the        *
* front, and replace with the specially shielded breather    *
* plugs. These breather plugs open at a preset pressure      *
* and should be installed in place when the unit is in       *
* operation. Failure to do this could result in damage       *
* to the equipment and endanger the operator's safety.       *
**************************************************************
```

1-6. Before placing the unit in operation, remove the shipping plugs at the top of the radiator, near front, and substitute with the specially shielded breather plugs. Use a 3/4 end wrench for this purpose - do not lose the O-Ring seal.

1-7. These breather plugs open at a preset pressure and should be installed in place when the unit is in operation. Failure to do this could result in damage to the equipment and endanger the operator's safety. The use of these vent plugs also protects the breather openings against intrusion of foreign material while allowing venting of the tank. The shipping

plugs, with O-Ring seals, should be replaced whenever the unit is to be transported. Be sure to use both plugs.

1-8. THERMOSWITCH

1-9. The dummy load is provided with a over-temperature thermoswitch assembly, P/N 8890-008. When installed on the back of the radiator, opposite end to the RF input, it will prevent damage to the load which could occur form accidental transmitter power overload or equipment malfunction. Being normally closed, the thermoswitch opens at a maximum safe temperature. As connected in series with the transmitter interlock, it cuts off transmitter power if the load temperature exceeds this value. The assembly consists of a thermoswitch body, P/N 8890-005, with a coupling jack, P/N 2450-018, attached to it.

1-10. Where the Series 8920 TERMALINE® Load Resistor was originally supplied without a thermoswitch, the thermoswitch must be field installed. Follow the steps below:

a. Replace the vent plugs with shipping plugs. Stand unit on its front end with connector end down. In this position there is no danger of coolant spillage. Support the radiator on its front face so the connector is not damaged.

b. Using a 9/16 Allen wrench, remove the socket plug on the rear face of the radiator.

c. Replace the plug with the thermoswitch. Use an acceptable pipe sealing compound sparingly on the external threads of the thermoswitch, only. Do not contaminate coolant with pipe sealing compound. Observe closely for coolant leaks upon completion.

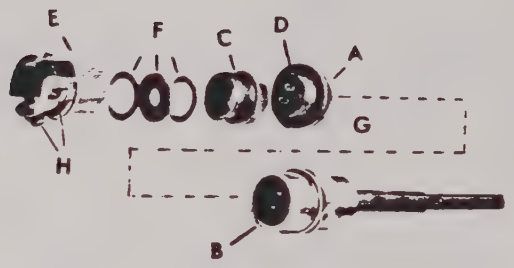
1-11. See Figure I-1 and connect the thermoswitch as follows:

a. Unscrew the larger knurled ring nut (A) at the lower end of the coupling jack assembly and pull off from the thermoswitch jack (B). Unscrew the small knurled cover fitting (C) from the base plug (D) of the connector to release the base.

b. Thread interlock wires through the clamp (E) with washers (F) inside, and with its threaded fitting in place. Service the interlock wire with short tips, use spaghettis tubing over the wire ends if needed, then securely solder the interlock leads to the lugs (G) of the connector base. Note - Be sure that the larger captive ring nut (A) is in place over the base plug (D) with the knurled end outward, towards face.

c. Screw on the cover ring (C) first, fasten the cable clamp (E) in place, and tighten the two yokescrews (H) on the cable. Push the plug back on the thermoswitch and tighten the knurled connecting ring. Do not attempt to operate the equipment without the interlock attached.

Figure 1-1. Thermoswitch Assembly (P/N 8890-008).



SECTION II - THEORY OF OPERATION

2-1. DESCRIPTION

2-2. The Series 8920 equipment consists essentially of an RF housing assembly containing a resistor, a thin-film-on-ceramic substrate type, immersed in a dielectric coolant. The resistor which is individually selected for its accuracy, is enclosed in an exponentially tapered housing, providing a reduction in surge impedance directly proportional to the distance along the resistor. When the resistor unit is immersed in the dielectric coolant, the characteristic impedance will be 50 ohms at the connector end. It will gradually decrease from there to zero ohms at the rear, where the resistor joins the housing to form the return conductor of the coaxial circuit. This produces a uniform, practically reflectionless line termination over the stated frequencies of the load resistor.

2-3. COOLANT

2-4. The dielectric coolant, a low volatility, high flash point synthetic liquid is chosen for its desirable thermal characteristics and dielectric properties, to which the diameters of the resistor housing are matched.

2-5. A synthetic rubber O-Ring around the outside of the resistor housing mount furnished a seal for the radiator opening. A beveled flange retains the O-Ring. The O-Ring is pressed against the radiator face by the drawing up action of a radial V-band clamp around the enclosing beveled flanges.

2-6. HEAT TRANSFER

2-7. When the input power is applied, the resistor generates heat which is absorbed by the adjacent dielectric coolant. By convection, the heated liquid flows through holes in the coaxial shell to the walls of the fabricated metal tank. The series of radiating fins transfer the heat of the dielectric coolant into the surrounding air.

SECTION III - OPERATING INSTRUCTIONS

3-1. LOAD RESISTOR CONNECTION

a. The load is ready for connection as received from the factory. It may be useful to check the 50 ohm input resistance of the load before attachment, see Section IV - Maintenance.

b. Check and clean the connecting surfaces of the coaxial RF transmission line. If necessary, clean the insulator surfaces on the transmission line. Use any good contact cleaner or dry cleaning solvent on a cloth.

c. Attach the load resistor to the RF line as follows:

1. Model 8921 - Use 50 ohm coaxial cable such as RG-218/U or -220/U (-17A or 19A) with suitable LC plug attached.

2. Model 8922 - 1-5/8" EIA Flanged, 50 ohms. Coupling kit, P/N 4712-020, which includes four 5/16-18 x 1-1/2 bolt sets, O-Ring and anchor bullet.

3. Model 8926 - 3-1/8" EIA Flanged, 50 ohms. Coupling kit, P/N 4600-020, which includes six 3/8-16 x 1-1/2 bolt sets, O-Ring, and center conductor anchor bullet.

d. Model 8927/28 - 3-1/8" Unflanged, 50 ohm, flush center conductor. Use Bird coupling kit, P/N 5-726 (RCA MI27791K-4A) consisting of outer sleeve with two clamping bands and the center conductor coupling bullet. The Model 8928 is similar except for a recessed center conductor requiring a special center conductor bullet. Make sure all connections are properly tightened. Avoid the use of adapters and elbows whenever possible.

3-2. LOAD RESISTOR OPERATION

****
* W A R N I N G *
*
* Using this load in the upper end of its power dissipa- *
* tion range will cause the housing to become hot! Care *
* should be exercised in touching it. *
****

****
* C A U T I O N *
*
* Do not excessively overload these units above the rated *
* 5 kilowatts of power. Overload for any length of time *
* will cause resistor failure. *
****

3-3. Proceed according to the instructions pertaining to the specific transmitting equipment. There are no operating controls on these load resistors; therefore, once installed the presence of an operator is not required.

3-4. For direct reading of power measurements up to five kilowatts, these loads may be used in conjunction with various Bird THRULINE® Wattmeters.

3-5. Due to the difference in VSWR between the dummy load and the transmitter's antenna, readjustment of the transmitter may be required when reconnected to the original antenna.

SECTION IV - MAINTENANCE

4-1. GENERAL

4-2. The Series 8920 TERMALINE® Load Resistors are rugged and simple. It should require only nominal routine attention. The load will operate for long periods of time if its power handling capabilities are not exceeded.

4-3. CLEANING

```
**************************************************************
*                        W A R N I N G                       *
*                                                            *
* Provide adequate ventilation and observe normal precau-    *
* tions when using dry cleaning solvents. Many dry           *
* cleaning agents emit toxic fumes that may be harmful       *
* to your health if inhaled.                                 *
**************************************************************
```

4-4. The outside surface of the instrument should be wiped free of dust and dirt when necessary. Clean the RF input connector with any good contact cleaner or other dry cleaning solvent on a swab stick. Take special care to clean the metallic contact surface and the exposed faces of the teflon insulator.

4-5. LOAD RESISTOR CHECK

4-6. Accurate dc measurement of the input resistance will provide a good check of the condition of the load resistor. For this measurement a resistance bridge, or ohmmeter, with an accuracy of one percent or better at 50 ohms should be used. Use low resistance leads, preferable a short piece of 50 ohm cable, with clips which can attach to the center and outer conductors of the coaxial input connector of the dummy load. When the resistor is checked at room temperature, the measured resistance should be within a range of 49 to 52.5 ohms. If the value considerably exceeds this allowance, the load resistor may need replacement.

4-7. LOAD RESISTOR REPLACEMENT

4-8. To change the load resistor assembly -

a. Place the unit on its back end, connector up. When lifting the radiator front, be careful its top side always faces up. The vent holes at the radiator top are so placed, that when the equipment is up-ended at the front, the coolant level will be just below the vent holes and will not spill out.

b. Loosen the #10-32 x 1-1/2 screw on the clamping band. Remove the clamping band, and lift the load resistor assembly out of the tank allowing residual coolant to drip back into the tank.

c. Cover the tank until reassembly to prevent coolant contamination. The load resistor assembly is not subject to further disassembly by

field maintenance, and a defective unit should be replaced in its entirety.

d. Before replacing a load resistor, be sure that the O-Ring seal is in good condition. It should be free of twists and positioned evenly all around the beveled flange of the resistor housing.

4-9. COOLANT

```
**************************************************************
*                      C A U T I O N                         *
*                                                            *
* Use no other coolant than that provide by Bird Elec-       *
* tronic Corporation. The use of any other dielectric        *
* coolant will alter seriously the stated specifications.    *
**************************************************************
```

4-10. The level of the dielectric coolant should remain constant in the unit after prolonged usage under normal operating conditions. Inspect occasionally around the lower portion of the clamping band, for possible coolant leakage. Tighten the clamping screw if required. Under very unusual conditions it may become necessary to replace the resistor housing seal O-Ring. Proceed as described in 4-7, Load Resistor Replacement.

4-11. Check the coolant level by placing the load on end with the input connector up. As above, remove the load resistor assembly. When the unit is at ambient temperature, the coolant level should be within 4-3/4" to 5" (125mm) below the top surface of the load resistor assembly mounting ring. The unit is factory filled to this level with 6-2/3 gallons (25.23 liters) of specially selected dielectric liquid, P/N 5-1070-3. NO OTHER COOLANT MAY BE USED.

4-12. When the coolant liquid is heated, thermal expansion will cause an increase in internal pressure. The breather vent plugs near the top of the radiator tank are provided to relieve this pressure while protecting the tank openings from possible entry of dirt or other contamination.

4-13. RF INPUT CONNECTOR

4-14. The input connector on the Model 8921 only, is of a special Bird "Quick Change" design which permits easy interchange of connectors with only simple tools. This process does not in any way disturb the coolant seal or interfere with the essential coaxial continuity of the load resistor input. Normally a Female LC connector is supplied with the Model 8921.

4-15. If replacement of the RF input connector becomes necessary, proceed as follows:

a. Remove the four #8-32 x 5/16 round head machine screws from the corners of the RF connector.

b. Pull connector straight out.

c. Reverse the preceding procedure to install new connector. Make certain that the projecting center contact pin of the "QC" connector is carefully engaged and properly aligned with the mating socket of the load resistor before pushing it home.

SECTION V - REPLACEMENT PARTS LIST

5-1. SERIES 8920

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	RF Load Resistor	
		Model 8921	8890-050
		Model 8922	8892-015
		Model 8926	8891-050
		Model 8927	8897-003
		Model 8928	8898-006
2	1	Clamping Band Assembly (2430-043 & Screw)	2430-055
3	2	Seal, O-Ring (Vent & Shipping Plug)	5-504
4	1	Radiator Assembly	8921-002
5	1	Radiator, Shell Unit Only	8921-019
6	1	Radiator Cover, Front	8921-012
7	1	Radiator Cover, Rear	8921-013
8	2	Breather Vent	2450-094
9	2	Plug, Shipping (Replace Item 8)	2450-049
10**	1	Thermoswitch Assembly, Overtemperature	8890-008
11**	1	Body, Thermoswitch (Item 10)	8890-005
12**	1	Jack, Thermoswitch Connector	2450-018
13	6-2/3 gallons (25.23 liters)	Dielectric Coolant	5-1070-3 (5 gallon container)
14	1	Seal, O-Ring RF Assembly	5-230
15	1	"QC" Connector	*See Below

*Available QC Type Connectors

LC-Female	4240-031
LC-Male	4240-025
LT-Female	4240-018
LT-Male	4240-012
7/8" EIA	4240-002

**Optional items

Figure 5-1. Shipping Plug - Remove and replace with vent plug when load is in operation.

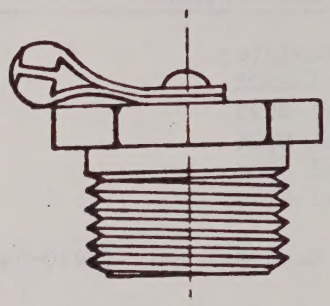
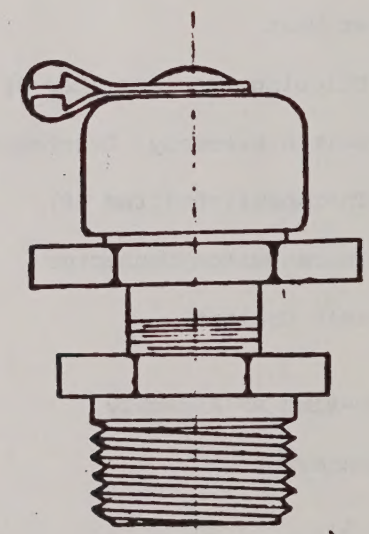


Figure 5-2. Shielded Vent Plug Assembly - Must be installed in place of shipping plug when load is put in operation.



QUALITY INSTRUMENTS FOR RF POWER MEASUREMENT

From 2 to 2300 MHz and from 25 milliwatts to 250 kilowatts in 50-ohm coaxial line systems.

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®
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